

### Does visual experience influence proprioception? A comparison of passive arm matching between blind and sighted participants.

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# Aix+Marseille Does visual experience influence arm proprioception and its lateralization? université Evidence from passive matching performance in congenitally-blind and sighted adults.

Elbow

Wrist

10

8

6

2 -

0 -

error  $(^{\circ})$ 

signed

Variable

1) Passive reference presentation and memorization

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# Introduction

Proprioception is key to perception and action,

but how can it be improved?

Here we tested the hypothesis that vision calibrates proprioception. If so, one could predict that lack of vision impairs proprioception.

However, there is evidence of compensatory, cross-modal plasticity in blind individuals:

supranormal auditory perception, supranormal tactile perception ... One could thus predict that lack of vision improves proprioception.

Proprioception is not homogenous across the body: for instance, proprioception of the non-dominant arm is often more accurate/precise than proprioception of the dominant arm. Considering that lateralization differs between blind and sighted, we predicted that visual experience would influence the lateralization of arm proprioception.

# Methods: two groups of right-hand adults

Sighted individuals (n=8; 3 females); Age 43 ± 17 years

# Congenitally blind (n=8; 3 females); Age 43 ± 13 years

Blind subject	Etiology	Independence in orientation & mobility	Age	Sex	Occupat
1	Congenital glaucoma	Low	21	Male	Studen
2	Congenital eye malformation	Very low	26	Male	Job seek
3	Congenital glaucoma	High	44	Male	Association vo
4	Congenital glaucoma	Moderate	45	Male	Technology instruc
5	Leber congenital amaurosis	High	49	Female	Engine
6	Congenital glaucoma	High	50	Female	Association vo
7	Congenital glaucoma	Moderate	53	Female	Association vo
8	Congenital glaucoma	High	61	Male	Piano tuner and

Marseille, France

# Methods: Passive, ipsilateral matching task



2) Passive return to

the starting zone

# Results on proprioceptive perception **B-Sighted group** C – Congenitally-blind group 10 ○ Sighted • Congenitally-blind 2 – Dominant Dominant Non-dominai Non-dominan (Left) arm (Right) arm (Left) arm (Right) arm



- ion
- ker
- olunteer
- ctor for blind
- er
- olunteer
- olunteer
- nd repairer

### A-Interaction between visual experience and arm



# Take-home

Non-dominant

Left) arm

Dominant

(Right) arm

- specialization.
- in healthy individuals.



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Blindfolded participants Slow motion (speed < 5 deg/s)

Non-dominant or dominant arm Elbow or wrist joint

6 trials/condition, in random order

## Data analysis

Mean signed error, mean absolute error Variable (SD) signed error, absolute error

# 2 Groups x 2 Arms x 2 Joints

**Proprioceptive perception is more precise for the non-dominant arm** of healthy individuals, a robust finding likely related to limb/hemispheric

**Proprioceptive lateralization is influenced by lack of early visual experience.** Visual feedback specifically improves non-dominant arm proprioception